

Chemistry Quiz
Liquids, Solids, and Phase Changes
Instructor's Version

Answers to Section I (Multiple Choice)

1.	E
2.	C
3.	D
4.	A
5.	B
6.	D
7.	A
8.	E
9.	D
10.	C

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Answers to Section II (Free Responses)

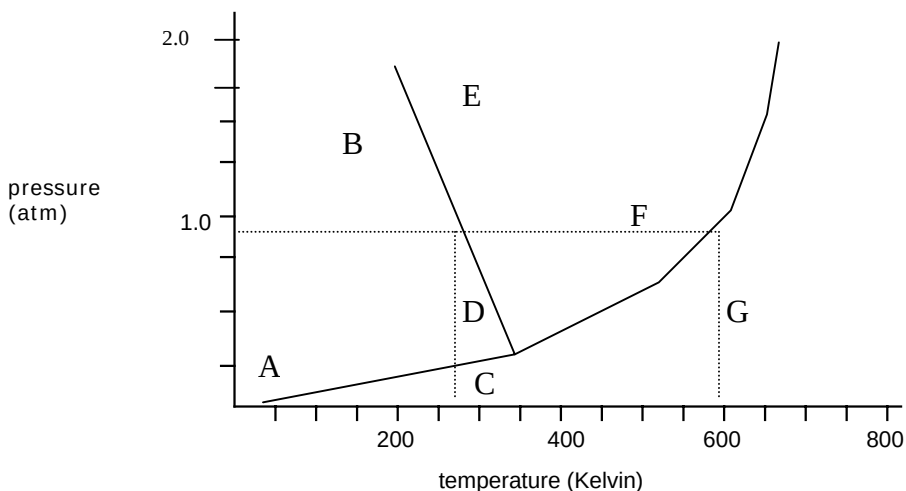
Time Limit: You have 30 minutes to complete this section.

Scoring: 60 points total; question 1 is worth 30 points and question 2 is worth 30 points; points for each section are indicated within the question.

Calculator Use: You may not use a calculator for either of these problems.

1. Phase diagram.

Use the phase diagram below to give the following information, the number of points for each is listed after each question: (30 points total)



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- A. Give the temperature and pressure of the triple point, the critical point, the normal mp, and the normal bp. (2 points each)**

Answer:

tp = 345°C, 0.3 atm; cp = 670°C, 2 atm; nmp = 265°C, 1 atm;
nbp = 600°C, 1 atm student responses should agree within 10%

- B. Indicate the phase change that occurs when moving from the first point to the second point in each of the following pairs of points: A → B, E → B, F → D, B → C. (2 points each)**

Answer:

A → B no phase change occurs, E → B freezing (solidification accepted), F → D freezing (solidification accepted), B → C sublimation

- C. If there is an increase in pressure at point G, could it cause a phase change? (2 points) If so, which kind? (2 points)**

Answer:

Yes, an increase could cause the substance to condense.

- D. From point A, what must happen for melting to occur? (2 points)**

Answer:

There must be an increase in both temperature and pressure. Zero credit for only one given.

- E. Would the solid float or sink in the liquid? (2 points) How can you tell from this phase diagram? (6 points)**

Answer:

The solid would float in the liquid. An increase in pressure from point D will cause a change from solid to liquid. This indicates that the liquid phase is denser than the solid, therefore the less dense solid would float in the more dense liquid.

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2. Relating Properties to Bond Types. (30 points total)

- A. Unknown substances A-E were examined in the chemistry laboratory. Data was collected about their physical properties. For each of the substances, please indicate which type of solid it is: network, molecular, metallic, or ionic (5 points). Give a brief explanation of how you determined the type of solid. (15 points)**

	Melting temp. (°C)	Electrical conductivity (qualitative)	Conductivity of aqueous solution
A	330	Poor	Good
B	1800	Poor	NA
C	123	Poor	Poor
D	182	Poor	Poor
E	204	Good	NA

Answer:

- | | | |
|----------|------------------|--|
| A | Ionic | A moderately high melting point with, conductivity in solution and as a liquid, are the main indicators that this is an ionic compound. |
| B | Network | The extremely high melting point with no conductivity is a dead give away that this is a network solid. |
| C | Molecular | The low melting point indicates that it is likely a molecular substance, the lack of conductivity confirms it is not metallic and the lack of conductivity of the solution shows that it is not ionic. |
| D | Molecular | The combination of low melting point and overall poor conductivity make this a candidate for molecular. |
| E | Metallic | The main indicator is the conductivity of the solid with a relatively low melting point, which shows that it would not be a conducting network solid. |

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- B. Rank the following substances from lowest to highest melting point. Please note that ionic substances melt at higher temperature than metallic substances and metals melt at higher temperatures than molecular substances. (10 points)**

solid wax ($C_{20}H_{42}$)	RbBr	quartz	bromine	Al_2S_3
brass	neon	BaTe	diamond	solid paraffin ($C_{28}H_{58}$)

Answer:

Lowest

neon

bromine

solid wax ($C_{20}H_{42}$)

solid paraffin ($C_{28}H_{58}$)

brass

RbBr

BaTe

Al_2S_3

quartz

diamond

Highest

One point each, partial credit can be given for small segments that are in the correct relative order